

## Tutorial 1

### Human Computer Interaction (CSE 353)

Full Marks: 30 Time: 50 Minutes

**Answer any four from the following short question**

2.5\*4

1. Define Human Computer Interaction. Write the goal of HCL.
2. Write two advantages and disadvantages of using command line interface in the system.
3. Define Design and User Centered Design.
4. Write a short note on Ergonomics.
5. Write the seven stages of Donald Norman's model of interaction.

**Answer any four from the following question**

5\*4

1. What are the different style of interaction? Explain detail about WIMP interface.
2. Explain Shneiderman's 8 golden rules of interaction design.
3. What do you understand by Paradigms of interaction? Explain details about paradigms of interaction.
4. Write details about Abowd & Beale's model of interaction.
5. Explain User Centered Design. Why we use User Centered Design?

# **Tutorial 3**

**Course Name: Human Computer Interaction**

**Time: 45 minutes**

## **Part A**

**4\*3**

- 1) State the PAC model.
- 2) Write the techniques of Goal and Task Hierarchies model.
- 3) Write the task of Physical and Device Model.

## **Part B (answer any two)**

**9\*2**

- 1) Explain the Seeheim Model in detail.
- 2) Briefly Discuss about Linguistic Model and what are the techniques used in linguistic model. Explain.

## Tutorial 2

### Human Computer Interaction (CSE 353)

Full Marks: 30 Time: 50 Minutes

1. Answer all the question. 5
  - a) The Model-View-Controller (MVC) is an \_\_\_\_\_ pattern that separates the application into three main \_\_\_\_\_ components.
  - b) Wire-Framing is a way to design a website service at the \_\_\_\_\_.
  - c) A Prototype is \_\_\_\_\_, not a detailed description of project.
  - d) Horizontal prototype implemented in \_\_\_\_\_ mode.
  - e) Examples of vertical prototype is \_\_\_\_\_.
2. Short question (explain in short). 5\*2
  - a) Define Online Rapid Prototyping technique.
  - b) Write two advantages and disadvantages of low fidelity and high fidelity prototyping.
  - c) Draw the Interactive model.
  - d) Write the components of Wire Framing.
  - e) Write two benefits of Model View Controller.
3. Answer any two questions out of three. 7.5\*2
  - a) Define Model View Controller. Explain in detail about the components of MVC.
  - ~~b)~~ Define Prototyping technique. Write about Rapid Prototyping Technique.
  - ~~c)~~ Explain Waterfall Model lifecycle.

Jahangirnagar University

Department of Computer Science and Engineering

3<sup>rd</sup> Year 2nd Semester

CSE 357 ( Microprocessors )

Time : 40 minutes

Total Marks:15

Answer any three of the following questions

1. Discuss the evolution of microprocessors. 5
2. What are the basic differences between an accumulator based microprocessor and a general purpose microprocessor? Define RISC microprocessor. (2.5+2.5)
3. Differentiate between RISC and CISC type microprocessor. Discuss PUSH and POP operation of microprocessor. (2.5+2.5)
4. Discuss the FLAG register of 16 bit microprocessor. 5

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3<sup>rd</sup> Year 2<sup>nd</sup> Semester

CSE 357 ( Microprocessors)

Time : 40 minutes

Total Marks:15

Answer any three of the following questions

1. Draw the block diagram of 8237 DMA controller along with associated logic and explain its role as a slave and master. 5
2. Discuss the READ and WRITE cycle timing diagram of a typical semiconductor memory with different parameters. 5
3. What do you mean by addressing modes? Explain at least six addressing modes with examples? 5
4. Describe briefly synchronous and asynchronous communication 5

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3<sup>rd</sup> Year 2nd Semester

CSE 357 ( Microprocessors )

Tutorial no.2

Time : 40 minutes

Total Marks:15

Answer any three of the following questions

1. Draw the pin diagram of 8086 microprocessor when it works in maximum mode and give a truth table of pin no. 26,27 and 28. 5

~~2. Draw the internal architecture of 8086 microprocessor. Explain how physical address is calculated from logical address in a 16 bit microprocessor. (3+2)~~

3. Describe main memory array design using full decoding technique. 5

4. Define and state the purpose of interrupts. Draw an interrupt vector table. 5

Time : 40 minutes

Total Marks:15

Answer any three of the following questions

5. Discuss the evolution of microprocessors.
6. What are the basic differences between an accumulator based microprocessor and a general purpose microprocessor? Define RISC microprocessor. (2.5+2.5)
7. Differentiate between RISC and CISC type microprocessor. Discuss PUSH and POP operation of microprocessor. (2.5+2.5)
8. Discuss the FLAG register of 16 bit microprocessor. (5)

## Tutorial -4

1. Draw and describe internal architecture of 80286 microprocessor. What are program invisible registers.
2. Write a short note on memory addressing modes of 80386.
3. What is the difference between the 80286 real address mode and protected virtual address mode? Explain how protected virtual address mode is used to calculate the physical address.

Time : 40 minutes

3<sup>rd</sup> Year 2nd Semester

CSE 357 ( Microprocessors )

Tutorial no.2

Total Marks:15

Answer any three of the following questions

1. Draw the pin diagram of 8086 microprocessor when it works in maximum mode and give a truth table of pin no. 26, 27 and 28. 5

2. Draw the internal architecture of 8086 microprocessor. Explain how physical address is calculated from logical address in a 16 bit microprocessor. (3+2)

3. Discuss the READ and WRITE cycle timing diagram of a typical semiconductor memory with different parameters. 5

4. Define and state the purpose of interrupts. Draw an interrupt vector table. 5

5. What do you mean by addressing modes? Explain at least six addressing modes of 8086 microprocessor with examples? 5

Time : 40 minutes

Total Marks:15

Answer any three of the following questions

1. Draw the block diagram of 8237 DMA controller along with associated logic and explain its role as a slave and master. 5
2. Describe briefly synchronous and asynchronous communication.
3. Illustrate how a 64 key keyboard and an 8 digit seven segment display can be connected to an 8279.
4. Define 2- key lockout and N-key rollover. Draw the general structure of the Intel 8279 Keyboard/display controller. 5

1. What is the main drawback of byte stuffing technique of framing? Give the best case and worst case of 'bit stuffing' and 'byte stuffing'. Mention the type of traffic applicable for ARQ and FEC.
2. A pure ALOHA system uses 200 kbps channel where on an average each terminal generates frame of 2000 bits, where each user on average transmits one frame on every 15 second. How many terminals the system can accommodate? Repeat the job for slotted ALOHA case.
3. An information source generates message bit string,  $M = 10111011$  (8 bits) and generator bit string,  $G = 10001$  (5 bits)  
i) Determine the polynomials:  $R(x)$  and  $T(x)$  (ii) probability of  $G(x) = E(x)$ .

10+10+10

w the sink tree of the fig.1 taking A as the root/destination.

If the new delay of links associated with node J of fig.2 is, JA=18ms, JI= 20ms, JH=13ms and JK= 36ms then determine the new delay of J to F using help of following routing table under distance vector routing algorithm.

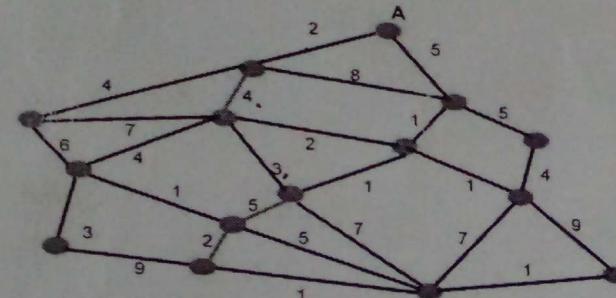


Fig.1

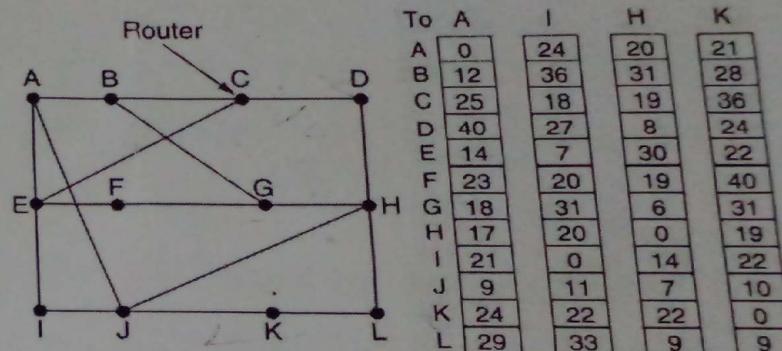
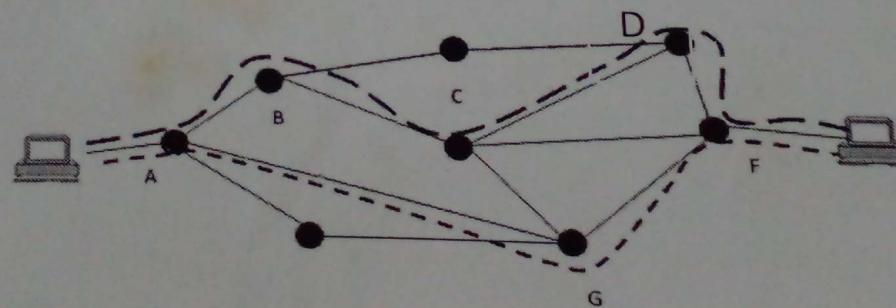


Fig.2

3, Show the routing table of router A for connectionless service considering first few packets follow the path A-G-F and the subsequent packets follow A-B-C-D. Draw the routing table of all routers of path A-G-F for connection oriented service.  $5 + 10 + 5 = 20$



- . Compare Cryptography and cryptanalysis. Apply transposition ciphers on the plain text, '*I am a student of jahangirnagar university under the department of CSE*' using the key '**CSEJUTRD**'. Is there any way to recognize the word 'jahangirnagar'? How transposition and substitution ciphered text can be recognized from cipher text?
2. Give basic principle of asymmetric key cryptography. Taking  $p = 2$  and  $q = 7$  determine all the parameters of RSA. For  $d = 7$ ,  $e = 3$  and  $n = 33$ , encode and decode the image  $\begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ .
3. How to ensure confidentiality eliminating BB in digital signature? Show the arrangement of Secure Hash Algorithm-1 and RSA for signing of a message.

1. What is the main drawback of byte stuffing technique of framing? Give the best case and worst case of 'bit stuffing' and 'byte stuffing'.
2. Draw the timing diagram of Stop-and-Wait Flow Control for both 'transmission time' > 'propagation delay' and 'transmission time' < 'propagation delay' then comment on the diagram.
3. An information source generates message bit string,  $M = 1\ 01\ 0\ 1\ 0\ 0\ 1$  (8 bits) and generator bit string,  $G = 1\ 0\ 0\ 0\ 1$  (5 bits) i) Determine the polynomials:  $R(x)$  and  $T(x)$  (ii) design the divisor circuit.

1. Compare active and passive intruder. How a cipher text can be understood as substitution or transposition ciphered at a glance. Give an example of transposition ciphering on a plain text taking "JAHNGIRU" as the key.
2. Give basic principle of asymmetric key cryptography. Taking  $p = 3$  and  $q = 11$  determine all the parameters of RSA then verify encryption and decryption of the vector  $V = [7 \ 12 \ 3]$ .
3. Compare conventional and digital signature based on Inclusion, Relationship and Duplicity. Show the arrangement of digital signature using SHA-1 and RSA.

1(a) Draw the sink tree of the fig.1 taking A as the root/destination.

(b) If the new delay of links associated with node J of fig.2 is, JA=20ms, JI= 25ms, JH=18ms and JK= 30ms then determine the new delay of J to F using help of following routing table under distance vector routing algorithm.

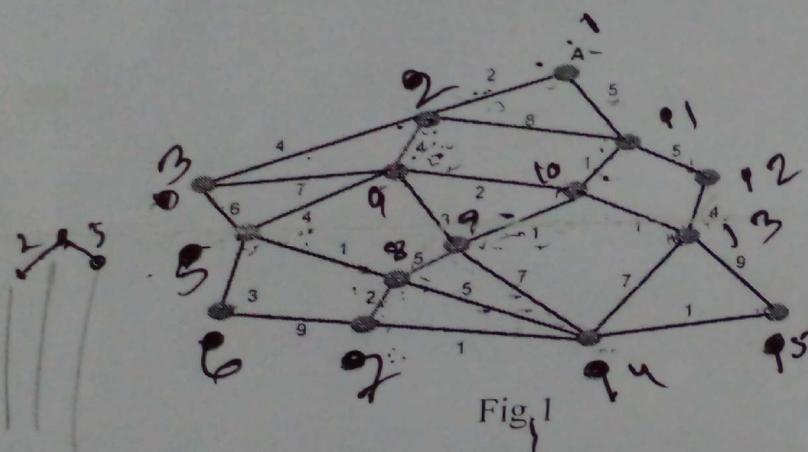


Fig.1

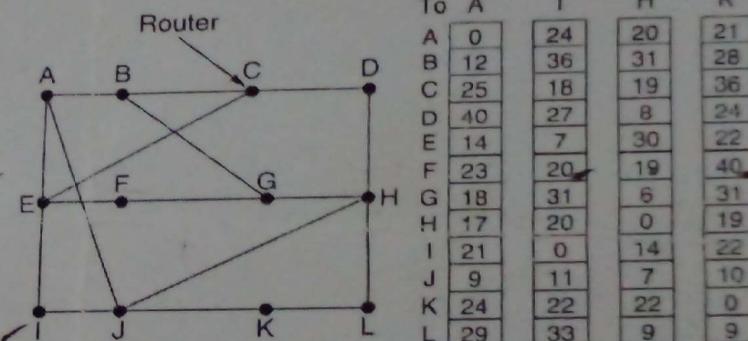
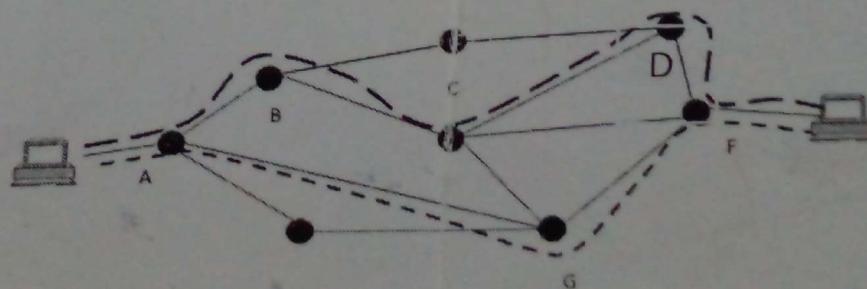


Fig.2

$$\begin{array}{r}
 30 \\
 40 \\
 \hline
 18 \\
 19 \\
 \hline
 25 \\
 20 \\
 \hline
 45 \\
 \hline
 I \\
 23 \\
 20
 \end{array}$$

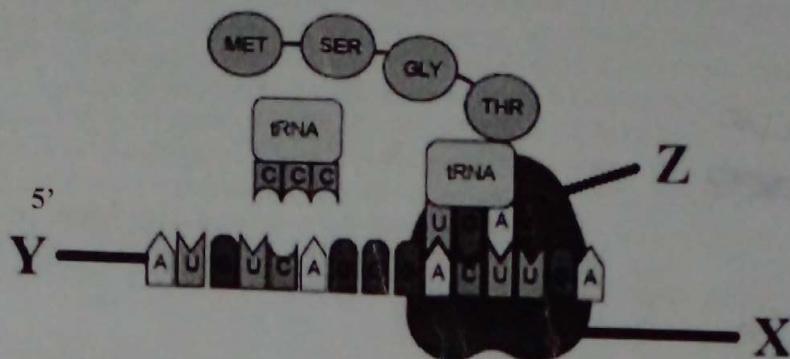
2. Show the routing table of router A for connectionless Service and routing table of all routers for connection oriented Service.





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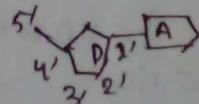
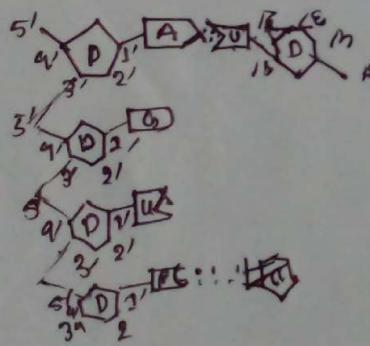
Q1. Answer the following questions considering the diagram shown as:



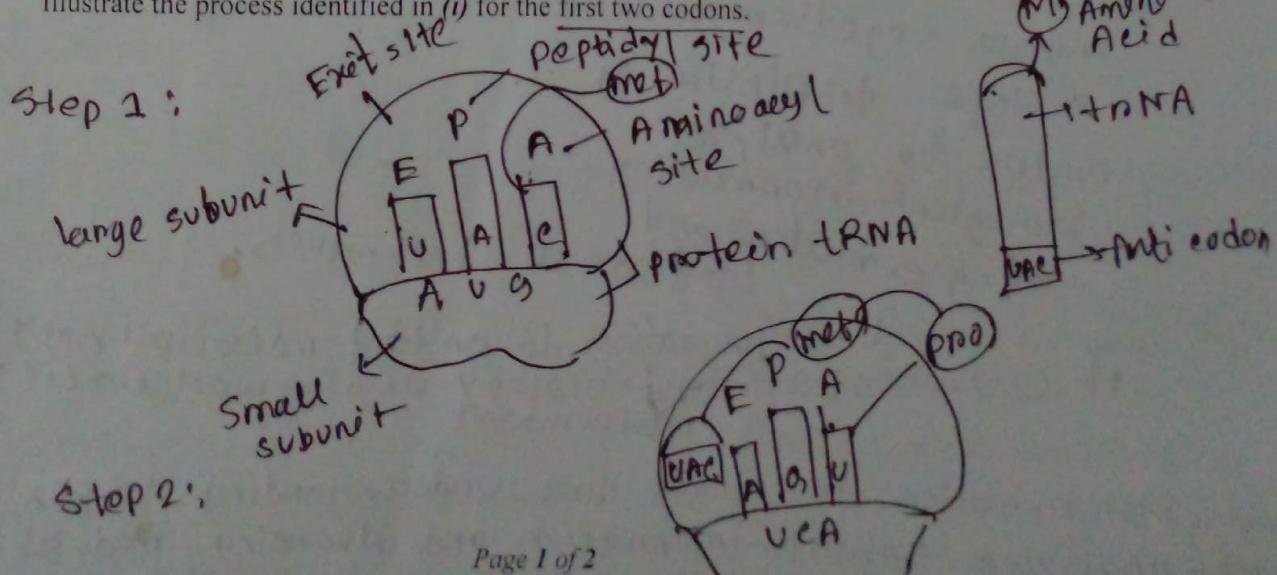
- i. The process depicted in the diagram is called ..... **translation** 1  
ii. The component X is called ... **smaller subunit** and its functions is ... **decoding the genetic message** 2  
iii. The component Z is called ..... **larger subunit**. Describe it in brief. 2

It is a part of the ribosome, the cellular machinery responsible for protein synthesis. It consists of 3 RNA molecules (18S rRNA, 5.8S rRNA, 5S rRNA) and around 50 proteins. The 60S subunit catalyzes the formation of peptide bonds between amino acids to form a polypeptide chain during translation.

- iv. Y is called..... **mRNA** 1  
v. Draw the double helix DNA structure of the hypothetical gene represented by Y. 3



- vi. Illustrate the process identified in (i) for the first two codons. 3



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QUESTION

- Q2. Consider the following coding strand DNA sequence of the hypothetical color producing gene in some eukaryotic cell of an organism. [use the codon table provided at the end] [5]

	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	
DNA	T	A	C	G	C	T	T	C	G	A	A	G	C	T	C	A	A	C	G	G	C	A	C	T	
mRNA	5' GTP	A	U	G	C	G	A	A	G	C	U	U	C	G	A	G	U	U	S	C	C	G	U	G	A
Amino acid sequence	met	Arg	Ser		Phe	Glu																			Poly-A-tail

start codon

After the nitrogenous base at **position 5** being mutated to nitrogenous base A, investigate the impact on the nature of the protein.

It allows researchers to unravel the intricacies of biological systems, leading to discoveries in genetics, drug development and personalized medicine.

merge together to form a single discipline in order to analyze biological information using computers and statistical techniques.

Second nucleotide				
U C A G				
First nucleotide	U	C	A	G
	UUU Phe	UCU	UAU Tyr	UGU Cys
	UUC	UCC	UAC	UGC
	UUA Leu	UCA	UAA STOP	UGA STOP
C	UUG	UCG	UAG STOP	UGG Trp
	CUU	CCU	CAU His	CGU
	CUC	CCC	CAC Pro	CGC
	CUA	CCA	CAA Gln	CGA Arg
A	CUG	CCG	CAG	CGG
	AUU	ACU	AAU Asn	AGU Ser
	AUC	ACC	AAC	AGC
	AUA	ACA	AAA	AGA
G	AUG Met	ACG	AAG Lys	AGG Arg
	GUU	GCU	GAU	GGU
	GUC	GCC	GAC	GGC
	GUА	GCA	GAA Glu	GGА Gly
Third nucleotide	GUG	GCG	GAG	GGG

Codon table

- Q3. Define bioinformatics. Bioinformatics is an interdisciplinary field of science, statistics, biology and computer science.

- Q4. Mention the goals of bioinformatics.

studying Bioinformatics is crucial for understanding complex biological data, analyzing genomic information and advancing medical research. Bioinformatics skills are essential in the era of big data, enabling effective interpretation of vast biological datasets for improved healthcare and biological insights.



। দেখি সব পারি কিনা।

- Q1. a) You must have heard about the story of King Solomon and two mothers claiming an infant baby where true mother begged Solomon not to cut the baby. Right! History has repeated once more in a village near JU where there lived five women and they had a fight for an infant baby and finally they decided to go to the village judge. To the judge, each of them claimed of being the true mother of the baby. To resolve the issue, the judge applied the strategy like king Solomon and ordered to cut the baby. Being very clever, all the woman urged to the judge not to kill the baby as they also knew the story of Solomon. Hence, the judge was in a fix what to do now! The judge came to know that you are bioinformatician and asked for your help. [8]

Partial DNA sequence of the women and the baby					
Baby:	ATCCTGGTACTG	Woman-3:	ATGGTGAAAGTG		
Woman-1:	CCGGAGAAGTAG	Woman-4:	CCGGAAAACTTG		
Woman-2:	AACGTGCTACTG	Woman-5:	TGGCCCTGTATC		

Evolution Distance Matrix						
	B	W1	W2	W3	W4	W5
B		9	2	4	9	10
W1			9	6	2	10
W2				5	9	10
W3					6	10
W4						10
W5						

You must remember that the judge does not understand any mathematical representation of proof but graphical one. Assume that evolution follows molecular clock hypothesis.

UPGMA

UPGMA is the simplest method for constructing trees. The great disadvantage of UPGMA is that it assumes the same evolutionary speed on all lineages, i.e. the rate of mutations is constant over time and for all lineages in the tree. This is called a molecular clock hypothesis,

The principle of the neighbor-joining method is minimum evolution, which selects the tree with minimum branch length. It is based on a very fast, greedy heuristic algorithm that generates sub-trees, and the closest sub-trees are joined to each other to yield the final tree, in a step-wise manner.

Phylogeny is the study of relationships among different organisms and their evolutionary development. (Evolutionary relationship among species)

Phylogeny can be of two types:

1. phenotypic phylogeny or morphological phylogeny
2. molecular phylogeny

Phenotypic phylogeny:

1. It is also known as morphological phylogeny.
2. Considered to be the traditional method.
3. Based upon the phenotypic observation from the group of organism.
4. Inefficient method to classify the micro-organism because phenotypic dissimilarity may be superficial.

molecular phylogeny:

In molecular phylogeny, analysis of DNA and protein structure is used to determine genetic relationships among different organisms. For example, the analysis of cytochrome c, a protein in cell mitochondria that functions in the electron transport system and energy production, is used to determine degrees of relationship among organisms based on similarities of amino acid sequences in cytochrome c. Similarities in characteristics of biochemical structures, such as DNA and protein, are then used to

develop a phylogenetic tree based on inherited shared traits.

### Phenotypic phylogeny

i) relies on observable physical traits,

ii) may be more useful when molecular data is unavailable or for studying morphological adaptations.

### molecular phylogeny

i). focuses on analyzing genetic material to determine evolutionary relationships.

ii) provides a more accurate and detailed understanding of evolutionary relationships especially for closely related species.

UPGMA (Unweighted pair group method with arithmetic mean)

- i) what it does: constructs a tree by successively joining pairs of sequences or clusters with the smallest genetic distance.
- ii) how it works: Assumes a molecular clock, uses average linkage.
- iii) Best for: small to medium sized datasets, hierarchical clustering.

Neighbour-Joining method:

- i) what it does: constructs a tree by successively joining pairs of clusters based on the smallest genetic distance.
- ii) how it works: Does not assume a molecular clock, minimizes total branch length.
- iii) Best for: large datasets, efficient clustering, varying rates of evolution.

Fitter-Margoliash method:

- i) what it does: Builds a tree by minimizing the difference between observed genetic distances and those predicted from tree.
- ii) how it works: Assumes a molecular clock, uses an optimization algorithm to find the best fit tree.

- iii) Best for: Large datasets, genetic distance based analysis.

b) Mention the differences between molecular phylogeny and phenotypic phylogeny.

[4]

c) Given the evolutionary distances between five different taxa: Horse, Donkey, Chicken, Penguin and Snake as shown:

	Horse	Donkey	Chicken	Penguin	Snake
Horse	0	5	9	9	8
Donkey	5	0	10	10	9
Chicken	9	10	0	8	7
Penguin	9	10	8	0	3
Snake	8	9	7	3	0

Interpret the evolutionary relatedness between Horse & Penguin and Penguin & Snake producing a phylogenetic tree using Neighbor Joining method.

Distance based 3 phylogenetic trees

VPGMA

Fitch-Margoliash method

Neighbour joining method

- Assumption

Assumes a molecular clock

Assumes a molecular clock

Does not assume a molecular clock

clustering

uses hierarchical clustering, average linkage.

uses an optimization algorithm to find the best-fit tree.

successively

joins pairs of sequences

clusters based on the smallest genetic distance.

produces an unrooted tree

tree type

produces a rooted tree

constructs an unrooted tree

large datasets, genetic distance based analysis

large datasets, varying rates of evolution, efficient clustering.

best for :

- small to medium sized datasets,
- hierarchical clustering,